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INFLUENCE OF FOOD, ANIMAL IDIOSYNCRASY, AND BREED ON THE COMPOSITION OF BUTTER.¹

ONE of the fundamental principles of dairying is regard for the influence which the care of the animal, supervision of the milking, separation of the cream, ripening of the cream, churning and washing, have on the quality of butter for table use. These processes also, together with the method of packing, have a notable influence upon the preservation of the butter in a sweet state. The discussion of the above problems, however, is a thing for the practical dairyman rather than the chemist. The chemical composition of butter-fat, as influenced by the character of food received by the animal, the race of the animal, and the peculiarities of the animal, has hitherto been little studied from a chemical point of view. To the latter subject I propose to devote the following paper.

Late in February this year, I received a letter from Professor H. H. Harrington, chemist of the Experimental Station of Texas, accompanied by two samples of butter, which he asked me to examine. The following extract from Professor Harrington's letter will indicate the motive which led him to send the samples:—

"Some work in our laboratory indicates that volatile acids from the cottonseed butter are much lower than has been generally supposed. I send two samples of butter, — one from cottonseed feed, and the other from feed containing no cottonseed. If you can do

me the favor of analyzing this butter, I shall send more samples from the same cows on the same feed. We hope in the near future to follow up these analyses with complete analyses of butter from different feeds, feeding two cows on cottonseed, and then changing them to other feed."

The samples sent by Mr. Harrington were small, and a complete analysis could not be made; but the results obtained are of such interest that I will communicate them at the present time, and call attention to the peculiarities noticed.

	Butter from Cottonseed.	Butter from Other Feed.
Volatile acids, No. cc N—10 BaO ₂ H ₂ for 5 grams.....	21.00	28.50
Percentage of iodine absorbed	33.40	31.89
Melting-point.....	45° C.	34°·2 C.
Reduction of silver by Bechi	distinct	none

The most remarkable points connected with the analyses are as follows: 1. The low percentage of volatile acids in butter from cottonseed; 2. The phenomenally high melting-point of the butter from cottonseed; 3. The persistence of the reducing agent of the butter from cottonseed, as indicated by its action upon nitrate of silver.

The melting-point of the butter is higher than that of pure lard. The particular point to be noticed in this matter is, that in butter designed for consumption in Southern countries, or produced in Southern countries, the mixture of cottonseed with the feed of cows will tend to raise the melting-point of the butter, and render it more suitable for consumption in hot climates.

The persistence of the reducing agent is also a matter of interest. It has passed, in the samples examined, through the digestive organism of the cow, and has re-appeared in the butter with almost undiminished activity. The selective action of the digestive organs on the different glycerides contained in the food of the animal is also a matter of importance. It would be expected *a priori* that the butter from a cow fed largely on cottonseed-oil would contain more oleine and have a lower melting-point than if ordinary food were used. On the contrary, it is seen that either the more solid glycerides have been absorbed during the process of digestion, or that the oleine has undergone some distinct change in the digestive organism by which it has assimilated the qualities of the other glycerides.

From an analytical point of view, the results are of great importance, since they show that a butter derived from a cow fed on cottonseed-meal or one excreting a fat of unusual quality might be condemned as adulterated when judged alone by the amount of volatile acids present. Since cottonseed-meal is destined to be a cattle-food of great importance, especially in the southern part of the United States, this is a fact of the greatest interest to analysts.

The observation of Mayer, soon to be mentioned, that the specific gravity of butter-fat varies with its content of volatile acids, I have also verified in some cases by the determination of the specific gravity of samples of butter-fat taken from the milk of the same cows kept on the same food, but taken the following day after the samples mentioned. The specific gravity for the cotton-meal fed sample was .8929 at 99°; that for the ordinary fed sample, .8991 at 99°.

Professor Mayer's experiments were made on a single cow of a North Holland breed. From time to time during the progress of the experiments the original food was used, in order to see what effect the period of lactation would produce. The cow was fed for twelve days on each separate ration before the samples were taken. After two days more, another set of samples was taken, and then the food changed for a new experiment.

In the butter-fat the melting and solidifying points were taken, and the volatile acids determined according to the method of Reichert. The specific gravity was also determined by the Westphal method at 100°.

The rations of the cow were composed of the following ma-

¹ Abstract of a paper by H. W. Wiley, read before the Society for the Promotion of Agricultural Science at its annual meeting held in Toronto, Canada, Aug. 26, 27, 1889.